14.

Systematic Notes on Bermudian and West Indian Tunas of the Genera *Parathunnus* and *Neothunnus*[1].

William Beebe
&
John Tee-Van
Department of Tropical Research,
New York Zoological Society.

(Plates I-VII).

Outline.

Introduction.

During 1934 and 1935 the game fishermen of Bermuda became interested in fishing for tuna and the result during those two years was the capture of at least 400 fish, ranging from 10 ounces to 60 pounds. Some fifty-three of these fish were brought to the Nonsuch laboratory during 1935 by various interested persons and the following notes have been made from investigations on these specimens. We are especially indebted to Mr. Childs Frick, Mr. and Mrs. E. J. Weir, Captain Christiansen, Major Davis, Mr. Leslie Howard, Mr. Robert Blackman, Mrs. Willett, Colonel Edwin Chance, Commander Landman and Mr. Beecham.

In addition to these Bermuda specimens we have been able to examine

[1] Contribution from the Bermuda Biological Station for Research, Inc.
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critically twenty-eight examples of these fishes at various localities in the West Indies, while we were the guests of Dr. and Mrs. Henry D. Lloyd on board their yacht *Hardi Biaou.* All of the observations were made upon fresh specimens.

The name "tuna" in Bermuda is applied to three fish—the common tunny, *Thunnus thynnus* (Linnaeus), a rare fish at Bermuda; the yellow-finned tuna, *Neothunnus argentivittatus* (Cuvier and Valenciennes), known from Bermuda by two specimens recorded in this paper; and the black-finned tuna, *Parathunnus atlanticus* (Lesson). The present paper is concerned with the two latter species.

The taxonomy of the tuna and other mackerel-like fish is in great confusion. This is due both to the inadequacy of early descriptions, definitions and illustrations, to ignorance of the changes occurring during growth, as well as the difficulty of preserving large specimens for detailed laboratory examination. Many of the older descriptions are meager and lacking in necessary detail, and the result is that anyone searching the literature soon finds that he has at hand a mass of data that cannot be coordinated or correlated. For that reason the specimens in this paper have been described in detail, so that comparisons with fishes of other localities can be made more easily.

BLACK-FINNED TUNA

Parathunnus Kishinouye 1923.
Parathunnus atlanticus (Lesson) 1830.

(Plates I & II).

Synonomy.

Thynnus atlanticus Lesson, 1830, In Duperrey, L. I., Voyage autour du monde—sur la corvette . . . "La Coquille," pendant . . . 1822-25. Paris, 1830, II, p.165. (Trinidad Island, South Atlantic).

Thynnus balteatus Cuvier and Valenciennes, 1831, Hist. Nat. Poiss., VIII, p. 98 (136). (Trinidad Island, South Atlantic).

Parathunnus obesus (not of Lowe), Beebe and Tee-Van, *Zoologica,* X, 1928, p. 100 (Haiti).

Parathunnus rosengarteni Fowler, 1934, *Proc. Acad. Nat. Sci. Phila.,* LXXXVI, p. 354, 356, figs. 3, 4, 5, (Florida).

Parathunnus ambiguus Mowbray, 1935, Description of the Bermuda Large-eyed Tuna Parathunnus ambiguus, n. sp., by Louis L. Mowbray, Curator of Government Aquarium, Bermuda, May 1935. (Three page, unpaged, privately printed pamphlet). (Bermuda; type not designated).

Parathunnus atlanticus, Beebe and Hollister, 1935, *Zoologica,* XIX, 6, pp. 213-214 (Union Island, Grenadines, B. W. I.); Beebe, 1936, *Royal Gazette,* Hamilton, Bermuda, Jan. 20, 1936, p. 10 (Bermuda).

Taxonomic Notes.

The Black-finned Tuna of the Western Atlantic has been named twice during the last three years, and investigation of the literature shows, as indicated in the preceding synonomy and the following notes, that at least two additional older names have been applied to this fish.

Cuvier and Valenciennes in 1831 gave a short description of a new species, *Thynnus balteatus,* stating "Cette espèce ne nous est connue que par un dessin fait par M. Lesson, vis-à-vis la Trinité, du Brésil, par les 20° de latitude australe, d'après un individu de vingt-huit pouces." The descrip-

tion is of a tuna with complete scalation and with a pectoral fin intermediate in length between the short pectoral of *Thunnus thynnus* and the exceptionally long pectoral fin of *Germo alalunga*.

However, Lesson a year earlier, in 1830, under the name of *Thynnus atlanticus*, had already described this same fish, evidently from the identical drawing, as he states in his description "Cette bonite a 28 pouces ....." "Nous primes cette bonite, non loin des Martin-Was et de l'île de la Trinite ....." Lesson's description is considerably longer and better than that given by Cuvier and Valenciennes. Evidently the latter authors saw only Lesson's drawing of the fish, which, apparently, was never published, and were not aware of his previous description.

The subsequent history of these two names is that they have usually been synonymized under the long-finned albacore, *Germo alalunga*. The latter name, as reference to Jordan and Evermann's "Fishes of North and Middle America," will show (I, p. 871), has been a catch-all for at least five authentic but poorly known species.

The identification of *atlanticus* and its synonym *balteatus* with *Germo alalunga* is quite wrong and the former species should be placed in the genus *Parathunnus*. As far as the pectoral is concerned, *Germo alalunga* possesses an exceptionally long fin, measuring some 2.3 to 3 times in the length of the fish—the tip of the fin usually extending beyond the posterior tip of the soft dorsal. *Atlanticus*, from the original description and from the description of the nominal *balteatus*, has the same measurement, 4.6 and 4 respectively, in the *total* length. These two proportions must be reduced somewhat as they are in the total length instead of the standard. However, even after being reduced, the figures show a fin considerably shorter in *atlanticus* than in *alalunga*, a condition that is specifically mentioned in the description of *balteatus*. In the original description of *atlanticus* and in our entire recent series the pectoral fin measures from 1 to 1.17 times in the length of the head.

These figures for fins and other characters given in the descriptions of *atlanticus* and *balteatus* agree with the accounts of *Parathunnus rosengarteni* and *Parathunnus ambiguus* and with recent Bermuda and West Indian specimens of *Parathunnus* examined by the present authors. In order to correlate the various accounts the following table is included, listing the proportions and counts of the various nominal forms and comparing them with our series of Bermuda and West Indian specimens and our previously reported Haitian specimen.

In reviewing the proportions and counts given under the various headings it will be noticed that the number of soft dorsal fin rays recorded for *atlanticus* in Lesson's original description is 8, this author making no distinction between rays and spines. This count is in disagreement with the descriptions of Fowler's *rosengarteni* (IV, 13), Mowbray's *ambiguus* (I, 12 to 13) and our Bermuda material, the latter being topotypical with Mowbray's *ambiguus*.[2] This discrepancy can be assigned either to the fact that Lesson, and Cuvier and Valenciennes described the species from an imperfect drawing or to the difficulty of counting the rays, a task that is especially troublesome in these fishes, as the fins are encased in rather thick skin and the rays and spines can be accurately counted only by removing the skin with a scalpel.[3]

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[2] The difference in fin count has already been ignored by previous authors when *atlanticus* was placed in the synonomy of *Germo alalunga*. The latter species has a fin count comparable to that of the later recorded specimens of *atlanticus*.

[3] In this respect it is of interest to note that until very recently the soft dorsal and anal fins of these fishes have been consistently described as possessing but a single anterior spine. Fowler (1928, Fishes of Oceania, pp. 132, 133; 1934, *Proc. Acad. Nat. Sci. Phila.*, LXXXVI, p. 354) has found a multiple number of spines in the anterior portion of the soft fins in a number of species, a condition that apparently holds true for most of the scombroids.

TABLE I.

Parathunnus atlanticus (Lesson). Proportions and counts of original descriptions and of a series of Bermuda and West Indian recent specimens.

	atlanticus, original description of Lesson, 1830	*alalteatus*, original description of Cuvier and Valenciennes, 1831	*rosengarteni*, original description of Fowler, 1934	*ambiguus*, original description of Mowbray, 1935	*atlanticus*, series of 52 Bermuda specimens. Beebe and Tee-Van, 1935	*atlanticus*, series of 22 specimens, Tobago, B.W.I., Beebe and Tee-Van, 1936	*atlanticus*, 2 specimens from St. Lucia, B.W.I., Beebe and Tee-Van, 1936	*atlanticus*, 1 specimen from Grenada, B.W.I., Beebe and Tee-Van, 1936	*atlanticus*, 1 specimen from Haiti (recorded as *obesus*), Beebe and Tee-Van, 1928
Length in millimeters	710	710	713[1]	?("...1½ lbs. to 60 lbs.")	263 to 583	383 to 570	560	374	629
Length in inches	28	28	28	?("...1½ lbs. to 60 lbs.")	10.5 to 23	15 to 22.5	22	14¾	24
Depth in length	3.5*	...	3.66	3.4 to 3.6	3.12 to 3.76	3.7 to 4.05	3.4	3.5	3.6
Head in length	4*	...	3.5	3.3 to 3.5	3.1 to 3.4	3.25 to 3.6	3.15	3.4	3.3
Eye in head	4.67	...	4.87	5.3	4.35 to 6	5.2 to 5.5	5.2	5.2	5.2
Snout in head	...	...	3.2	3	3 to 3.5	2.9 to 3.3	3.2	3.3	3.3
Maxillary in head	...	...	2.5	2.4	2.45 to 2.5	2.4 to 2.5	2.5	2.5	...
Interorbital space in head	...	...	2.6	3	3 to 3.1	3.06 to 3.2	3	4	...
Dorsal Fin — Spinous	14	14	13	14	13 to 14	13 to 14	14	14	14
Dorsal Fin — Second	8	...	IV, 13[2]	I, 12 to 13	III or IV, 10 to 12[2]	III, 11[2]	IV, 11[2]	III, 12[2]	II, 12[2]
Dorsal Fin — Finlets	9	9	8	9	7 to 8	8 to 9	9	8	8
Anal Fin — Fin	8	...	IV, 11[2]	II, 12	II to III, 10 to 12[2]	III, 11[2]	III, 10[2]	III, 11[2]	II, 11[2]
Anal Fin — Finlets	8	...	7	8	7 to 8	7 to 8	8	7	8
Pectoral fin length in length	4.65*	4*	3.75	3.3 in 24″ fish, longer in smaller fish.	3.3 to 3.7	3 to 3.7	3.85	3.4	3.8
Pectoral fin length in head	1.17	...	...	...	1 to 1.1(1.37 in 263 mm. fish)	.9 to 1.08	1.24	1	...
Pectoral fin ray count	35	...	I, 30	...	I, 32-33	I, 31-32	I, 33	I, 30	...
Gill-rakers, upper limb	...	...	...	6	5 to 6	5 to 6	5	5	...
Gill-rakers, lower limb	...	...	...	17	15 to 18	15 to 16	15-16	16	17
Middle eye to snout in head	...	...	...	...	2.4 to 2.5	2.4 to 2.44	2.37	2.47	...
Snout to pelvic fin origin in length	...	...	...	...	2.75 to 2.9	2.8 to 2.9	2.8	2.95	...
Snout to 1st dorsal fin in length	...	...	...	...	2.95 to 3.2	3 to 3.1	3	3	...
Snout to 2nd dorsal fin in length	...	...	...	...	1.67 to 1.76	1.66 to 1.76	1.7	1.7	...
Snout to anus in length	...	...	...	...	1.45 to 1.5	1.46 to 1.53	1.5	1.5	...
Height 1st dorsal spine in head	2.3	...	2	...	2.2 to 2.45	2.15 to 2.5	2.35	2.5	...
Height 2nd dorsal fin lobe in head	2.3	...	2.25	...	2.7 to 3.1	3.1 to 3.6	2.9	3.6	...
Height anal fin lobe in head	2.3	...	2.5	...	2.85 to 3.4	3.2 to 4.2	3	4.2	...

* Proportions marked with an asterisk are taken in the total length of the fish, consequently these proportions must be reduced somewhat to conform with the other figures.

[1] Described from a mounted specimen.

[2] The last ray of the soft dorsal and anal fins is a finlet which is firmly connected with the fin, and is here counted as part of the soft dorsal and anal fins. The finlets, therefore, in the next line, are only those that are free and unattached.

As a further indication of the identity of these fishes the following excerpts of color descriptions are cited: In every description of the various forms assigned to *atlanticus* there is mention of a lateral golden, orange or coppery band. Thus Lesson states, "Une large band de cuivre rouge doré vient de l'oeil, suit un instant la courbe de la ligne laterale, et va se perdre sur les côtes du corps au point ou il s'amincet." Cuvier and Valenciennes write of *balteatus*, ". . . depuis le maxillaire supérieur jusqu'à la queue, une bande de coleur de cuivre doré." Fowler's description of *rosengarteni* contains the following, ". . . From behind the eye rather dark golden band crosses corselet and continues along below lateral line to caudal peduncle . . ."; while Mowbray in the description of *ambiguus* states: "Colour, blue black above, a bright blue stripe, with one of yellow below it, separates the upper colour from the lower, . . ."

From the foregoing paragraphs it becomes evident that in the western Atlantic there exists a species of tuna with complete scalation, possessing a pectoral fin intermediate in length between that of *Thunnus thynnus* and *Germo alalunga*, distinctive gill-raker count, and a conspicuous type of coloration with a lateral golden or coppery band, and that the specific name *atlanticus* can be removed from the synonomy of *Germo alalunga* and be established as the proper name for this fish.[4].

Parathunnus obesus Lowe, described from Madeira in 1839, is very close to the present species. From the literature, especially Frade's redescriptions (1929, 1931), one of the few definite characters separating the two species is the shape of the air-bladder, which in *atlanticus* is simple, quite short and broader than long—totally different from the relatively complex air-bladder shown by Frade for *obesus* (1931, p. 121). The disparity in size of Frade's fish and the western Atlantic series makes it difficult to make adequate comparisons in other characters.

The specimen recorded by Beebe and Tee-Van from Port-au-Prince Bay, Haiti (1928, p. 100) as *Parathunnus obesus* has been reexamined; it is definitely *Parathunnus atlanticus*.

Description of Bermuda and West Indian Specimens.

The following description is based on previously published accounts plus notes made on the specimens that we have examined. In addition, the Table on Page 180 should be consulted for measurements and proportions not otherwise mentioned.

Parathunnus atlanticus.

Body thickset, spindle-shaped. Smaller individuals slightly more compressed laterally than the larger. Depth 3.12 to 4.05 in the length, the greatest depth of body about half way from base to tip of pectoral fin. Caudal peduncle depressed, with a triangular, rather short dermal keel on each side, the length of the keel being about one and one-half to two times the diameter of the eye. On the base of the caudal peduncle above and below the large keel is a very short, oblique dermal keel. A small keel on the body above the upper edge of the pectoral fin which allows the upper edge of the fin to lie flat with the contour of the body.

Body completely scaled, the scales small, compact, absent on head, smallest below, especially anteriorly—those between the pectoral and ventral fins minute. Scale from midside at vertical of the origin of the second dorsal

[4] If, very improbably, the Trinidad Island, South Atlantic fish *atlanticus* should prove to be different from the West Indian, Florida and Bermuda Black-finned Tuna, Fowler's *rosengarteni* will be the proper term for the northern form.

fin in a 443 mm. fish measuring 2.75 mm. high and 2.6 mm. long. Corselet small, inconspicuous, largely over the base of the pectoral.

Lateral line complete, slightly wavy, not very high anteriorly, becoming median in position only on the posterior caudal peduncle.

Head conical, 3.15 to 3.6 in standard length, the lower profile slightly more convex than the upper. Snout not especially sharp, 2.9 to 3.25 in the head length. Eye large, obliquely set in head, 4.35 to 6 in head length (5.3 to 6 in fish over 380 mm.); adipose eyelid very small; interorbital space convex, 2.6 to 3.6.

Posterior nostril an elongate vertical slit, its length slightly less than one-half the eye diameter. Anterior nostril very small, situated a considerable distance anterior to the posterior nostril and at the level of the upper edge of the latter.

Mouth oblique, the mouth opening convex when viewed from the side, the convexity being upward. Maxillary 2.4 to 2.5 in the head, its posterior margin extending from anterior margin of eye to anterior margin of pupil, the width of the posterior expansion being about 2 in the diameter of the eye.

Teeth moderate in jaws, uniserial, simple, conic, 33 to 40 above on each side (27, Fowler), 32 to 41 on each side below (32, Fowler). Vomer, palatines and a patch on the tongue with finely granular teeth.

Gill-rakers slender but strong, 4 to 6 plus 15 to 18 on the first gill-arch. In 58 specimens in which the gill-rakers were counted, 13, or 22 percent., had asymmetrical counts on the arches of the right and left sides. The seven combinations of the gill-raker counts in these thirteen specimens are as follows:

Gill-Rakers	Number of specimens
4+16 — 5+16	1
5+15 — 5+16	3
5+16 — 6+17	3
5+17 — 6+16	2
5+18 — 6+18	1
6+15 — 6+16	2
6+16 — 6+17	1

The remaining forty-five fish with symmetrical gill-raker counts distribute themselves as in the following table:

Rakers on upper limb of first gill-arch	Rakers on lower limb of first gill-arch		
	15	16	17
5	5	13	1
6	..	15	11

Dorsal fin XIII to XIV—III or IV, 10 to 13 (last ray a connected finlet)—VII to IX. Second dorsal spine highest, the first almost as high as the second, the spines after the second becoming progressively shorter, first abruptly and then gradually. Soft dorsal low. Anal fin II to III, 10 to 12 (last ray a connected finlet)—VII to VIII. Anal lobe similar to dorsal in shape and size.

Coloration: This species in life is exceedingly brilliant. A 555 mm.

specimen whose colors were recorded before the fish was removed from water was described as follows: Dorsal surface and inner side of pectoral fins jet black, the former bordered laterally with bright blue. A lateral band from snout to tail of brilliantly iridescent shining gold, very wide and including the outer side of the pectoral fin. Lower sides shining silver, with a large oval patch on the sides between the pectoral and pelvic fins silvery iridescent. Sides and ventral parts with eleven vertical bars and an equal number of bands of spots alternating with the bars. Second dorsal lobe with a tinge of yellow, but all other vertical fins black with a narrow white border, especially marked on the finlets.

Mowbray's description of his specimens is as follows: "Colour, blue black above, a bright blue stripe, with one of yellow below it, separates the upper colour from the lower, which is a silvery gray; region of the ventrals and the belly, milky white: the spinous dorsal is dusky, the membrane lighter than the spines.

"The soft dorsal and anal are dusky with a silvery lustre, the finlets are dusky, with a trace of yellow: this is more pronounced in some specimens: the pectorals are black, the base outwardly is washed with silver.

"The ventrals are milky white outwardly when closed, and dusky inwardly with a metallic lustre when opened: the caudal is dusky, the sides of the belly show white spots which appear as reticulations: this I believe to be seasonal, as I noticed them only in the winter months; I do not know if they disappear in G. alalunga or not."

There is considerable variation in color and in some specimens the lower side of the pectoral fin is silvery, the fin not being included in the golden lateral band. At death the golden band fades rapidly and usually only traces of it remain.

The finlets and the vertical fins are occasionally greenish, as stated by Mowbray, or even yellowish, but the fins are never as brilliantly colored as in *Neothunnus argentivittatus*. These two species need not be confused on this score, as the gill-rakers give an absolute differentiation in questionable specimens.

The colors of the smallest known specimen of *Parathunnus atlanticus* (263 mm.) were noted as follows: Bluish black above shading to grayish silvery on the sides and whitish below. Middle of sides somewhat lead-colored and with a series of five to six vertical lighter colored bands on the lower sides, extending upward as far as the median line of the body. These bands, posteriorily, are changed into series of horizontal, elongate spots forming broken vertical bands (see Pl. II, Fig. 4). Spinous dorsal, soft dorsal and dorsal finlets dusky, the latter with a pale upper edge. Pectoral blue-black above, grayish silvery below, darker toward the tip. Caudal fin dusky. Lower surface of pelvic fin white, upper surface dusky with a yellowish tinge, the rays brownish.

Mowbray states (1935) that "The white spots or reticulations supposed to occur only in young specimens of Germo are not present in the smaller specimens of this species." Our smallest fish, however, as described above, did have such spots and we have seen the pattern in other fish of this species in the West Indies. (See Pl. II, Fig. 4 of a Bermuda fish, and Pl. I, Fig. 2 of a fish from St. Lucia, British West Indies).

In other tunas this pattern is a juvenile one, and it has been previously reported from *Thunnus thynnus*[5], *Thunnus orientalis*[6], *Neothunnus argentivittatus*[7], *Neothunnus macropterus*[8] and *Parathunnus mebachi*[9].

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[5] Frade, 1929, *Bull. Soc. Portugaise des Sciences Nat.*, X, No. 20, 236.
[6] Kishinouye, 1923, *Journ. Coll. of Agriculture, Imp. Univ. of Toyko*, VIII, No. 3, 438-439.
[7] Cuvier and Valenciennes, 1831, Hist. Nat. Poiss., VIII, 98.
[8] Kishinouye, 1923, *Journ. Coll. of Agriculture, Imp. Univ. of Tokyo*, VIII, No. 3, 447.
[9] Kishinouye, 1923, *Journ. Coll. of Agriculture, Imp. Univ. of Tokyo*, VIII, No. 3, 444.

SIZE AND WEIGHT: This species, according to Mowbray, grows to a weight of 60 pounds. The sizes and weights of a few individuals measured by us are as follows:—

Length Millimeters	Inches	Weight Pounds
263	10.3	13 ounces
374	14.8	2.25
443	17.5	4.5
475	18.7	6.25
480	18.9	6.5
495	19.5	7.
530	21	6.75
560	22	11
583	23	12.5
660	26	15.5

RANGE.

Known from the coast of Florida, Bermuda, Haiti, Martinique, the following islands in the British West Indies: St. Lucia, Union, Grenada and Tobago, and from Trinidad Island, Brazil.

YELLOW-FINNED TUNA.

Neothunnus Kishinouye 1923.

Neothunnus argentivittatus (Cuvier and Valenciennes) 1831.

(Plates III-VII).

SYNONOMY.

? Scomber albacares, Bonnaterre, 1788, Tableau Encyc. Meth., Ichth., 140 (Madeira; after a drawing by Sloane, 1707).

? Scomber sloanei, Cuvier and Valenciennes, 1831, Hist. Nat. Poiss., VIII, 107 (Madeira; after a drawing by Sloane, 1707).

Thynnus argentivittatus, Cuvier and Valenciennes, 1831, *Hist. Nat. Poiss.*, VIII, 97 (Atlantic and Pacific Oceans).

Thynnus albacora, Lowe, 1839, *Proc. Zool. Soc. London*, VII, 77 (Madeira).

Thunnus allisoni, Mowbray, 1920, *Copeia*, 78, Feb. 11, 1920, 9-10. fig. (Florida).

Neothunnus albacora, Frade, *Rapp. Cons. Explor. Mer.*, 1931, 70, 123.

Neothunnus argentivittatus, Beebe, *Royal Gazette*, Hamilton, Bermuda, Jan. 20, 1936, 10 (Bermuda).

TAXONOMIC NOTES.

In 1707 Hans Sloane in "A Voyage to the Islands Madera, Barbados, Nieves, S. Christophers and Jamaica, with the Natural History ..... of those Islands," Vol. I, p. 11, described a tuna from Madeira. His description of the fish is as follows:

"The Sea hereabout is very well provided with *Albacores*, or Thynni, whose Description follows.

"The Fish was Five Foot long from the end of the Chaps to that of the Tail, the Body was of the make and shape of a Mackarel, being roundish

or torose, covered all over with small Scales, White in some places, and Darker coulour'd in others, there was a Line run along each side. The coverings of the Gills of each side were made of two large and broad Bones covered with a shining Skin, the Jaws were about Six Inches long, having a single row of short, strong, sharp Teeth in them, and were pointed. The Eyes were large, and the Gills very numerous, behind which were a small pair of Fins. *Post anum* was a Foot long Fin, about Three Inches broad at bottom, and Tapering to the end. It had another on its Back answering that on the Belly, and from these were small *Pinnulae* at every Two Inches distance to the Forked Tail, which was like a New Moon falcated, before which on the Line of the two sides was a membranous thick horny Substance, made up of the Fishes Skin, stood out about three-quarters of an Inch where it was highest, something like a Fin. It was about Three Foot Circumference a little beyond the head, where it was thickest. The Eye was about an Inch and a half Diameter. The Figure of this Fish is here added, Tab. 1, Fig. 1 taken from a dried Fish, where everything was perfect save the first Fin on the Back, which I suppose was accidentally rub'd off.

"It is frequently taken by Sailers with Fisgigs or White Cloath, made like Flying-fish, and put to a Hook and Line for a Bait; the Flesh is coloured and Tasts as the *Tunny* of the Mediterranean, from whence I am apt to believe it the same Fish. It is to be found not only about Spain, and in the way to the *West-Indies;* but in the South-Seas about *Guayaquil,* and between Japan and New-Spain every where."

From this account and figure (See Pl. VII, Fig. 13), Bonnaterre, in 1788, described *Scomber albacares,* and forty-three years later (1831) from the same data Cuvier and Valenciennes described *Scomber sloanei.*

Bonnaterre's description of *albacares* is as follows: "*L'Albacore* 9. *S. Albacares S. pinnulis plurimus*: *aristes duabus supra opercula, membrana lucida tectis.*

"Plusieurs fausses nageoires: deux arêtes couvertes d'une peau luisante au dessus des opercules.

"Le corps est rond & entièrement couvert de petites écailles: les mâchoires, dont la longeur est d'environ six pouces, sont armèes d'une seule rangée de dents courtes & très-aiguës. La nageoires du dos correspond à celles du ventre; elle est accompagnee de plusieurs fausses nageoires, éloignées les unes des autres, d'environ deux pouces; la nageoire de l'anus a un pied de long, fui trois pouces de large: elle se termine en pointe; celle de la queue est echancrée en croissant; les parties latérales de la queue forment, de part & d'autre, une saillie en carène, qui a trois quarts de pouce d'elevation. Quelqus parties du corps sont blanches; les autres sont d'une couleur foncée. Ce poisson a trois pieds de circonférence dans sa plus grande époisseur, & cinq pieds de longueur. *Sloane Hist. tho. Jamaic. vol.* 2, *p.* 11. *La Jamaique.*"

The following is Cuvier and Valenciennes' description of *Scomber sloanei*:

L'Auxide de Sloane.
(*Scomber Sloanei,* nob.)

"L'*albacore* de Sloane, si l'on peut s'en rapporter à une figure grossière, comme toutes celles qu'a données cet auteur, semble devoir appartenir à ces thons à dorsal écartées.

"Son museau est court; sa bouche, peu fendue, n'a que de petites dents. Sa première dorsale paraît avoir peu de rayons, et être séparée par un grand intervalle de la seconde. Ses pectorales sont courtes. Il a huit fausses nageoires en dessus, et sept en dessous de la queue; mais ce qui

paraît devoir lui former un caractères spécifique, c'est que sa seconde dorsale et son anale sont plus hautes et plus pointues à proportion, que dans aucune autre espèce; elles ont en hauteur plus du cinquième de la longueur totalle. Nous n'avons rien vu qui ressemble à cette figure."

The identity of Sloane's fish and consequently of the names *Scomber albacares* and *Scomber sloanei*, has always been questionable, and while Sloane's fish was, most probably, the long-finned, yellow-finned tuna here discussed, we cannot be certain of this because of discrepancies between modern specimens and Sloane's description, especially those relating to the length of the pectoral fins.

Sloane does not state the color of the fins of his fish. If he had, there would be considerable less difficulty in assigning a position to his tuna. The condition of the dorsal fin as shown in his figure, with a long space between the spinous and soft dorsal, which caused Cuvier and Valenciennes to assign a common name of "L'Auxide de Sloane" to this fish, may be explained by the fact that Sloane specifically states that the fin was damaged; this major discrepancy can thus be removed from the description of the fish. However, the one character that stands out in marked contrast to our knowledge of recent specimens of yellow-finned tuna is the length as shown in Sloane's figure of the pectoral fin. These fins are very much shorter than those of recent specimens, and Sloane definitely states of these fins ". . . and the Gills very numerous, behind which were a small pair of Fins."

We are thus left with the uncertainty as to the status of Sloane's specimens and the associated names, and while we might assume that the illustration was carelessly drawn with fins of wrong length, yet Sloane's definite statement in the text as to the size of the fins prevents our using either of the earlier names as the correct one for the yellow-finned tuna of the Atlantic.

It is of interest that modern authors such as Jordan and Evermann 1896, Jordan and Evermann 1926, Jordan, Evermann and Clark 1930, and Fowler 1928, have repeatedly given the type locality of *Scomber albacares* Bonnaterre as Jamaica. This is an error and the fish, according to Sloane's volume, was originally taken at Madeira.

The earliest valid description of the Atlantic yellow-finned tuna is that of Cuvier and Valenciennes, who in 1831, described *Thynnus argentivittatus* from a drawing of an Atlantic specimen taken by Quoy and Gaimard. The fish they described was a completely scaled tuna with pectoral fin intermediate in length between that of the common tuna and the long-finned albacore, *Germo alalunga*, and with a conspicuous coloration consisting of bright yellow fins and a combination of alternate white vertical bands and groups of spots on a slightly darker belly.

Lowe, in a brief description published in 1839, described *Thynnus albacora* from Madeira. This form was forgotten, as far as the literature is concerned, until the last few years, during which a number of observers have described it from various localities in the eastern Atlantic, the principal accounts being by Frade. Lowe recognized that the fish mentioned by Sloane was similar to his as he synonymized Sloane's account, and Cuvier and Valenciennes' *Scomber Sloanei* under *Thynnus Albacora.*

Mowbray in 1920 described *Thunnus allisoni* from Florida. This is the typical long-finned and yellow-colored large adult form of the species.

Study of the original descriptions of *argentivittatus* Cuvier and Valenciennes, *albacora* Lowe, the redescriptions of *albacora* by Frade, the original description of *allisoni* Mowbray, a single specimen taken by us in Bermuda, another Bermuda specimen taken in Bermuda by Mrs. W. B. Holler, and five fish taken by us in the West Indies, lead us to believe that all of these

relate to one species for which the name *argentivittatus,* Cuvier and Valenciennes, 1831, has priority.

Cuvier and Valenciennes' description of *argentivittatus* and the smaller Bermuda and West Indian specimens agree in possessing low dorsal and anal fin lobes, in contradistinction to the other original descriptions and our larger West Indian specimens. This condition is discussed on later pages.

The detailed measurements and proportions of the various original descriptions plus those of recent specimens, demonstrating the similarities, are shown in the table on Page 188.

Comparison of Specimens with High and with Low Soft Dorsal and Anal Fin Lobes.

The Atlantic species of *Neothunnus, N. argentivittatus,* (including *N. albacora*) and its Pacific congener *Neothunnus macropterus,* agree in possessing forms with short soft dorsal and anal fin lobes and others in which these fins are considerably produced, a fact that has caused discussion as to the specific validity of these types.

The preponderance of opinion, so far, both as to the Atlantic and Pacific species, has been that the high and the low-finned forms are the same, although Fowler (Proc. Acad. Nat. Sci. Phila., LXXXV, 1933, p. 163) evidently disagrees with this and has erected the genus *Semathunnus* for those with high soft dorsal and anal fin lobes, leaving the low-finned fish in *Neothunnus.*

Our recent observations of *argentivittatus* at Bermuda and in the West Indies, and its Pacific relative *macropterus* in the Gulf of California, coupled with examination of the literature has convinced us that the forms are the same species, possessing short soft dorsal and anal fin lobes while small, as Frade (1929) has already stated, the lobes becoming produced with growth. In the larger specimens there is a tendency for the fins to vary in length, some specimens having relatively long fins while in others they are relatively shorter. The fins of the same fish are not always equal in length (See Table II, last column) and Herre (1936) states of hundreds of Pacific *N. macropterus* that he examined: "Sometimes the anal, more rarely the dorsal, lobe would be elongated and the other remain comparatively short."

As far as the literature is concerned the following quotations are pertinent. Cunningham (Proc. Zool. Soc. London, 1910, p. 106), writing of *albacora* (which we here synonymize with *argentivittatus*) and comparing it with *Parathunnus obesus* and *Germo alalunga* states: "In one form, namely the common albacore of the inhabitants of St. Helena—there are considerable changes in the course of growth: but these changes do not lead to any approximation to the other forms but rather to a greater development of the special features: in a small specimen somewhat less than 3 feet in length the second dorsal and the first ventral [anal] fins were scarcely higher than in the other two forms, while in the other specimens the great vertical elongation of the fins is very characteristic." (See Pl. III, Fig. 5 of a Cunningham specimen).

Frade in speaking of his Atlantic specimens says: "Il est interessant de signaler que, comme pour *N. macropterus* du Pacifique, il existe pour la même taille deux types de *N. albacora;* l'un à 2e dorsale et anales longues, correspondant à *N. macropterus* forma *itosibi* et l'autre à 2e dorsale et anales courtes, correspondant à *N. macropterus* forma *macropterus.*"

Kishinouye, in his excellent study of Japanese *Neothunnus macropterus,* says: ". . . The second dorsal and anal are much elongated, especially in the variety named itoshibi or gesunaga, the tips of these fins are whitish and reach to the base of the caudal. So far as I have examined there is no

TABLE II.

Neothunnus argentivittatus (Cuvier and Valenciennes). Proportions and counts of original descriptions and of a series of recent Bermuda and West Indian specimens.

	argentivittatus, original description of Cuvier and Valenciennes, 1831	*albacora*, original description of Lowe, 1839	*albacora*, redescriptions of Frade, 1931	*allisoni*, original description of Mowbray, 1920	*argentivittatus*, 1 specimen from Bermuda, Beebe and Tee-Van, 1935	*argentivittatus*, 1 specimen from St. Lucia, B.W.I., Beebe and Tee-Van, 1936	*argentivittatus*, 1 specimen from St. Lucia, B.W.I., Beebe and Tee-Van, 1936	*argentivittatus*, 1 specimen from St. Lucia, B.W.I., Beebe and Tee-Van, 1936
Length in millimeters	686	?	991 to 1740	1752	555	645	690	1450
Length in inches	27	?	39 to 68	69	22	25	27	57
Depth in length	Proportions stated as being similar to common tunny	....	3.85 to 4.85	3.5	3.6	3.9	3.75	3.55
Head in length		....	3.5 to 4.2	3.87	3.34	3.4	3.5	3.9
Eye in head		....	6 to 10	7	5.7	6.2	6.4	8
Snout in head		....	(See below, middle eye to snout)	2.75	3.2	3	2.9	2.72
Maxillary in head		....	....	....	2.6	2.6	2.6	2.64
Interorbital space in head		....	2.25 to 3.25	....	2.7	2.87	2.9	2.5
Dorsal Fin: Spinous	14	....	....	14	14	14	14	14
Dorsal Fin: Soft	14 (no mention of height)	? (produced)	? (produced and not produced)	I, 11 (produced)	IV, 11 (not produced)	III, 11 (not produced)	III, 11 (not produced)	III, 10 (produced)
Dorsal Fin: Finlets	9	....	8 to 10	9	9	8	9	9
Anal Fin: Fin	11 (no mention of height)	? (produced)	? (not produced and produced)	I, 11 (produced)	III, 11 (not produced)	IV, 10 (not produced)	III, 11 (not produced)	III, 10 (produced)
Anal Fin: Finlets	9	....	8 to 10	9	9	8	8	9
Pectoral fin length in length	3.5*	4 to 5* (But tip reaches to middle of 2nd dorsal fin!)	3.45 to 4.65	"nearly equal to head"	3.45	3.5	3.4	4
Pectoral fin ray count	34	....	....	....	34	34	35	....
Gill-rakers, upper limb	....	....	....	9	10 to 11	9	9	10
Gill-rakers, lower limb	....	....	....	21	21	21–22	21	20
Middle eye to snout in head length	....	....	2.2 to 2.5	....	2.4	....	2.35	....
Snout to pelvic fin origin in length	....	....	3.1 to 3.6	....	....	2.96	3.1	3.42
Snout to first dorsal fin in length	....	....	3.1 to 4	....	3.1	3.1	3.1	3.55
Snout to second dorsal fin in length	....	....	1.7 to 2.1	....	....	1.75	1.8	1.88
Snout to anus in length	....	....	1.6 to 1.85	....	1.8	1.68	1.7	1.76
Height 1st dorsal spine in head	....	....	....	2	....	2.35	2.35	2.05
Height 2nd dorsal fin lobe in head	....	....	....	....	....	2.35	2.15	1
Height anal fin lobe in head	....	....	....	....	....	....	2	.55
Possesses silver bars and spots on lower sides	Yes	....	Yes in young	....	Yes	Yes	Yes	No

* Proportions marked with an asterisk are taken in the total length of the fish, consequently these proportions must be reduced somewhat to conform with the other figures.

marked difference in anatomical structure between the long-finned variety and the ordinary form, except in the length of the second dorsal and anal fins."

Combining the facts in these quotations with our own observations we come to the following conclusions: There is evident agreement that the dorsal and anal fins are low in the smaller individuals and grow longer in the larger: There is less agreement as to what happens in the fins of the fishes of larger size. Both Frade and Kishinouye state that there are two forms, a short-finned and a long-finned, and the former queries (1929, p. 238) as to the possibilities of these being different sexes. It is our belief that intermediate forms will be found completely connecting the two groups.

Two references relating to the closely related Pacific *Neothunnus macropterus* are in accord with this statement. Thus Herre (1936, pp. 106, 107) says: "I have examined many hundreds of this fine fish, alive, just taken from the water, and after preservation in ice, in the Philippines, and have also examined vast numbers of them in Japan. I agree with the late Dr. Kishinouye that there is no difference between those with the anterior dorsal and anal lobes of ordinary height and those in which the lobes, particularly the anal, extend to the base of the caudal or beyond. In a lot of several hundred caught in a fish corral at one time, there would be every graduation in the length of the dorsal and anal lobes. Sometimes, the anal, more rarely the dorsal, lobe would be elongated and the other remain comparatively short. My observations have been made upon specimens ranging in weight from 30 to 40 pounds up to those weighing nearly 400 pounds, their lengths varying from two-thirds of a meter to nearly three meters."

Walford (1936) writing of the Pacific yellow-finned tuna examined by him in canneries says: ". . . Among several hundred specimens that I examined there, the dorsal and anal fins were of all lengths, intergrading to such an extent that it is impossible to separate them into two groups. In general, the largest, consequently the oldest fish had the longest fins. Unless there are some other characters to separate the two—and no one has as yet been able to find any—it thus looks as if the Allison tunas of the Pacific coast are merely old specimens of the yellowfin."

The following table correlates the height of the dorsal and anal fin lobes in a series of Atlantic yellow-finned tuna of progressively larger size.

Locality	Length, mm.	Percent of standard length	
		2nd dorsal lobe	Anal lobe
Bermuda, Dept. Trop. Res. No. 25,206..	577	10.8%	10.1%
St. Lucia, B.W.I., Dept. Trop. Res. No. 24,682.....	645	12.5%	broken
St. Lucia, B.W.I., Dept. Trop. Res. No. 24,683.....	690	13.3%	14.3%
St. Helena, Cunningham, 1910 (P.Z.S.) (Photograph).....	930 app. Nearly three feet long	12.5%	?
Bermuda, (Holler specimen).....	1,220	21%	22%
St. Lucia, B.W.I., Dept. Trop. Res. No. 24,690.....	1,360	38.5%	48%
St. Lucia, B.W.I., Dept. Trop. Res. No. 24,689.....	1,450	36%	48%
Portugal, Frade, 1929.....	1,560	36%	39%
Canary Islands, Frade, 1931.....	990 to 1,740	36%	34.5%
Canary Islands, Frade, 1931.....	App. 1,600	35%	38%

It seems evident from the above tables and the preceding notes that the various nominal forms of the yellow-finned tuna belong to the same species, and that the forms typified by the large Allison's tuna represent but large-finned specimens of the smaller shorter-finned individuals. It is also evident that the genus *Semathunnus*, as far as Atlantic *argentivittatus* and Pacific *macropterus* are concerned, is untenable.

Description of Bermuda and West Indian Specimens.

The following description is of the first specimen taken at Bermuda: ♂, No. 25,206, Department of Tropical Research, New York Zoological Society; taken one mile south of Nonsuch Island, Bermuda, with rod and line by Mr. Beecham, July 27, 1935. Standard length 555 mm.; weight 8 pounds.

Field Characters: Robust, large, spindle-shaped, large-eyed fish with a fleshy keel on each side of the caudal peduncle and a series of finlets following the dorsal and anal fins; pectoral fins rather long, extending almost to the posterior end of the soft dorsal fin. Twenty-one gill-rakers on the lower limb of each gill arch. Dark blue above, white below; a series of alternate vertical narrow whitish bands and groups of spots on the lower sides. Dorsal fin and dorsal and anal finlets bright yellow.

Description: Body spindle-shaped, the depth 3.6 in the length, somewhat compressed, the greatest width of the body being 5.55 in the length; upper profile slightly more arched than the lower; caudal peduncle with a large, rather wide, dermal lateral keel and with two very small keels at the posterior end of the large keel—the latter is widest in its central portion tapering equally anteriorly and posteriorly. A groove along the sides into which fits the upper border of the pectoral fin.

Body covered with very small scales, smaller on the belly and larger immediately above the pectoral fin; corselet indistinct.

Lateral line indistinct anteriorly and slightly undulating, descending at the level of the posterior part of the spinous dorsal, posterior portion straight.

Head 3.34 in length; opercle gently rounded posteriorly; preopercle with its posterior limb not quite vertical and slightly concave.

Eye large, 5.73 in head and 1.8 in the snout, its vertical diameter slightly greater than the horizontal one. Adipose eyelids very slightly developed.

Anterior nostril minute, situated slightly nearer eye than tip of snout; posterior nostril a vertical slit, half an eye diameter in length and placed about one-third an eye diameter in front of eye.

Maxillary extending almost to anterior margin of pupil, its inferior margin rather abruptly downturned posteriorly. 31 to 34 teeth in each side of each jaw; the teeth small, conical and turned slightly inward. A granular patch of teeth on vomer and palatines.

Gill-rakers 10 or 11 plus 21 on first gill arch, the length of a median raker of the lower half of the arch being about 7/8 the diameter of the eye.

Dorsal fin XIV-IV, 11-IX, folding into a groove; first spine highest, the upper margin of the fin descending rather abruptly, the fifth spine only one-half as high as the first, the last spine a mere nubbin of 3 mm. Space between spinous and soft dorsal about equal to interspace between spines so that the two fins are practically continuous. Soft dorsal fin rather low, the height of the fin being 2.7 in the head and 2.6 in the pectoral length; fin followed by 8 free finlets.

Caudal fin with its posterior margin crescent-shaped, the expanse of the fin being slightly greater than the length of the head.

Anal fin originating under the next to the last ray of the soft dorsal, its lobe similar in shape to that of the dorsal; III, 11-IX. The first finlet of the nine is connected to the end of the anal fin.

Pectoral fin originating under origin of the spinous dorsal, the tip of the fin extending to the vertical of the 6th to 7th ray of the soft dorsal. Upper and lower margins of the pectoral fin almost parallel for the anterior half of the fin.

Pelvic fin originating under the anterior third of the pectoral fin base.

Measurements:

Total length: 577 mm.
Standard length: 555 mm.
Depth: 154 mm. (3.6).
Width of body: 100 mm.
Head: 166 mm. (3.34).
Eye: 29 mm. Greatest vertical diameter of eye: 32 mm.
Interorbital: 61 mm.
Snout: 52 mm.
Maxillary: 63 mm. Width of posterior expansion of maxillary: 13.5 mm.
Pectoral length: 161 mm.
Pelvic fin length: 60 mm.
Second dorsal fin lobe height: 62 mm.
Anal fin lobe height: 62 mm.
Height 1st dorsal spine: 63 mm.
Expanse of caudal fin: 185 mm.
Length of central caudal keel: 63 mm.
Greatest width across caudal keels: 49 mm.
Snout to middle of eye: 68 mm.
Snout to origin of 1st dorsal fin: 179 mm.
Snout to origin of pelvic fin: 188 mm.
Snout to origin of pectoral fin: 167 mm.
Snout to anus: 336 mm.

Counts:

Pectoral fin rays: 34.
Pelvic fin rays: I, 5.
Dorsal fin: XIV-IV, 11-IX.
Anal fin: III, 11-IX, first finlet connected to end of anal fin.
Gill-rakers: Right side 11 plus 21; left side 10 plus 21.
Teeth: Upper right 32; upper legt 33; lower right 31; lower left 34.

Coloration: Above dark metallic blue becoming silvery below, with purple and lilac iridescence in an indefinite band on each side of the white belly from the gills to the anal fin. Lower sides below the pectoral fin with eight more or less vertical whitish bars, alternating with similar vertical lines of small whitish spots, all on a dark grayish background. Pectoral fin silvery below, dark blue above; dorsal spines surrounded by narrow zone of yellow, which is less bright on the membrane of the fin; second dorsal orange-yellow, darker anteriorly, with a narrow black posterior edging and a small white tip to the fin; dorsal finlets bright yellow with dark margins; anal fin silvery at base, the remainder orange-yellow; anal finlets similar to dorsal but with considerable white posteriorly; pelvic fins dead white below; the rays when spread open are orange.

Variation: This species except for fin-lengths, which are discussed on preceding pages, does not differ much with age. The variations in propor-

tions are shown on the table recording the various specimens and original descriptions.

The white spots and bars on the lower sides of smaller fish are not visible on the larger individuals that we have seen.

Frade in his 1929 paper describes the coloration of his large fish as follows: "Coloration générale des spécimens adultes: toute la région dorsal au-dessus du bord supérieur de l'oeil et de la ligne latérale, et la queue, d'un bleu de Prusse opaque, plus clair vers la ligne latérale; regions operculaire, mandibulaire et ventrale d'un blanc métallique, ligèrement carminé, avec des tonalités verdâtres surtout vers la région anale. Ière dorsale avec les rayons cendrés jaunâtres et la membrane partageant de la même coleur mais plus foncée; 2ème dorsale et anale jaune foncé, s'atténuant vers l'extrémitié, l'anale avec des tons argentés sur la base. Pectorale verdâtre, la pointe noir bleuâtre; ventrale nacrée; caudal noir bleuâtre, jaunissant vers les extrémitiés. Pinnules jaune vif, liserées de noir."

A 1,450 mm. fish taken by us at Castries, St. Lucia, B.W.I., was recorded as follows: Dorsal surface bluish black changing into iridescent steel blue along the sides and silvery bluish white below; from anal fin to caudal the body below is silvery white. First dorsal with spines and most of the distal halves of the webs olive yellow. Second dorsal lobe yellow on distal third and yellowish to base of each edge. Anal lobe same as second dorsal. Caudal fin dark brown with yellow-white toward tips. Finlets bright chrome yellow with strong narrow black margins, especially prominent on the posterior edges.

In the smaller specimens the entire dorsal and anal fin lobes are brilliant yellow, and occasionally there is a golden band along the side of the fish from the snout through the eye above and over the pectoral fin. The smaller specimens also are characterized by the series of vertical alternate bars and groups of spots.

Size and Weight: The sizes and weights of a series of individuals of this species are as follows:

Length		Weight
Millimeters	Inches	Pounds
555	22	8
645	25.4	12
690	27	16
1220 (total)	48 (total)	45
1450	57	140
1750 (total)?	69 (total)?	143

Range.

Known from Scotland (?), Portugal, Angola, Canary Islands, Madeira, Bermuda, Florida, Martinique, St. Lucia, and St. Helena.

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EXPLANATION OF THE PLATES.

Plate I.

Fig. 1. *Parathunnus atlanticus* (Lesson). Copy of the original illustration of the type of *Parathunnus rosengarteni* Fowler, the drawing made from a mounted specimen.

Fig. 2. *Parathunnus atlanticus* (Lesson). 560 mm. (23½-inch) specimen from St. Lucia, British West Indies. Photograph by John Tee-Van.

Plate II.

Fig. 3. *Parathunnus atlanticus* (Lesson). 495 mm. (19½-inch) specimen from Bermuda. Photograph by John Tee-Van.

Fig. 4. *Parathunnus atlanticus* (Lesson). 263 mm. (10-1/3-inch) specimen from Bermuda. This is the smallest recorded specimen. Photograph by John Tee-Van.

Plate III.

Fig. 5. *Neothunnus argentivittatus* (Cuvier and Valenciennes). Specimen from St. Helena. Copy of plate labelled "*Thynnus albacora*," from Cunningham, *Proc. Zool. Soc. London*, 1910, p. 110, text-fig. 4.

Fig. 6. *Neothunnus argentivittatus* (Cuvier and Valenciennes). 555 mm. (22-inch) specimen from Bermuda. Photograph by John Tee-Van.

Plate IV.

Fig. 7. *Neothunnus argentivittatus* (Cuvier and Valenciennes). 48-inch specimen weighing 45 pounds, taken at Bermuda by Mrs. W. B. Holler of Birmingham, Michigan. Photograph by David Knudsen.

Plate V.

Fig. 8. *Neothunnus argentivittatus* (Cuvier and Valenciennes). 1,450 mm. (57-inch) specimen from Castries, St. Lucia, British West Indies. Photograph by John Tee-Van.

Fig. 9. *Neothunnus argentivittatus* (Cuvier and Valenciennes). Head of 1,450 mm. (57-inch) specimen from Castries, St. Lucia, British West Indies. Photograph by John Tee-Van.

Plate VI.

Fig. 10. *Neothunnus argentivittatus* (Cuvier and Valenciennes). Swim-bladder of 1,450 mm. (57-inch) specimen from Castries, St. Lucia, British West Indies. Photograph by John Tee-Van.

Fig. 11. *Neothunnus argentivittatus* (Cuvier and Valenciennes). Caudal keels of 1,450 mm. (57-inch) specimen from Castries, St. Lucia, British West Indies. Photograph by John Tee-Van.

Plate VII.

Fig. 12. *Neothunnus argentivittatus* (Cuvier and Valenciennes). 1,450 mm. (57-inch) fish being brought on board yacht at Castries, St. Lucia, British West Indies, showing type of native boat used for fishing for these giant fish. Photograph by John Tee-Van.

Fig. 13. Copy of original figure of Hans Sloane of the Madeiran albacore. (Sloane, Tab. 1, Fig. 1).